

Equity Revisited

I have spent considerable energy lately hunting for the latest research on the effectiveness of technology-enhanced project-based learning (PBL). I found very little research, but I did find recent reports prepared by the U.S. government, commissions, professional organizations, and other groups on the state of technology use in schools. I would like to focus this month's discussion on portions of three such reports:

- *enGauge 21st Century Skills: Literacy in the Digital Age*, published in 2003 by North Central Regional Educational Laboratory (NCREL) and the Metiri Group
- *Connecting the Bits*, published in 2000 by the NEA Foundation for the Improvement of Education (NFIE)
- *Learning for the 21st Century*, published in 2003 by the Partnership for 21st Century Skills

Taken together, these three documents provide a guide for ways of teaching with technology that should benefit all learners. It should come as no surprise that PBL provides a key teaching strategy. (*Editor's note:* Find information about these and other documents mentioned in this article under Resources on p. 39.)

I call this month's column Equity Revisited because in recent years we have seen an enormous number of articles decrying the Digital Divide as defined by rich versus poor access to technology. I do not dispute the claims of these articles, namely, that some groups in this society do not have the access either in their schools or in their homes to high-quality (or in some cases *any*) technological resources—little or no access to computer time, to software, to the Internet. To cite but one indicator from the enGauge report, recent figures show U.S. home computer

By Diane McGrath

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Three recent reports provide insight for teaching with technology to benefit all learners.

ownership figures of those from Asian or non-Hispanic White origin to be 12–24 percentage points above figures for other racial and ethnic groups. On the other hand, the same report cites recent evidence that 90% of all U.S. children ages 5–17 use computers, and 75% use the Internet. The 2002 Pew report *The Digital Disconnect* reports that 78% of students ages 12–17 use the Internet, and that 30–40% are what they call Internet-savvy, having used the Internet for 5–6 years.

What I would like to explore in this column, though, is not the question of equity of access, but rather the question of equity in what we do with technology. After all, what we have been investigating for the past year and a half in this column is the effect of how you learn on what you learn and how you feel about it. We will come at this question sideways, because we don't really know the answer to what different groups do with technology. We know that in 1999, Ray Yau, a research associate at the Mid-Atlantic Equity Center, reported that poor and minority students were given an excess of drill and practice and very little opportunity to use technology for higher-order thinking tasks. For our purposes here, we will look at both what the reports say we should be doing to ensure such equity and at what happens when the best of circumstances occur, when teachers and administrators receive support for changing the learning environment of their schools—schools with substantial populations of at-risk students.

Let's begin by looking at the skills we need in this century. I will assume that you agree with my premise: the goal is for all learners to be as successful as possible at learning, and we should do our very best to prepare them with the skills to successfully negotiate work, family, leisure, civic responsibility, cultural awareness and sensitivity, and adaptation to change.

enGauge's 21st Century Skills

The enGauge report discusses four sets of skills all learners need to successfully negotiate the 21st century:

- Digital-age literacy
- Inventive thinking
- Effective communication
- High productivity

I'd like to focus my discussion on the connection between these four sets of skills and the basic requirements for PBL. Let's start with the basic features of PBL:

- A driving question
- Construction and presentation of an artifact
- Collaborative research over an extended period of time
- Community of inquiry
- Use of technology-based cognitive and communication tools

Once students are engaged in research for a project by means of a driving question in an authentic con-

text, they are also engaged in most if not all of the 21st century skills in the enGauge report. They will need to be or become literate in both technology and the subject of their project, to understand points of view, to manage complexity, be self-directed, take responsibility, collaborate, communicate, plan, prioritize, use real-world tools, and produce relevant high-quality products.

The equity portion of the enGauge Web site strongly urges educators to provide equitable opportunities for low-income students to “generate content and to participate in the growth and use of online resources.” Further, low-income students must also “engage in the same types of high quality, cognitively demanding uses [of technology] at the same levels of frequency as their wealthier counterparts.”

My conclusion from reading this document is that technology-supported PBL is an excellent strategy



The four sets of 21st century skills are elaborated briefly here, giving us a fairly good notion of the ideas in the enGauge report. Reprinted with permission.

to encourage the development of 21st century skills. And, PBL is a strategy that should be used in classrooms with at-risk children as well as classrooms with high achieving or wealthy students.

Next, let's look at the observations made during a three-year research project in which 10 schools participated. We will focus on those findings related to PBL and at-risk learners and, we hope, learn something about what happens when schools actually do what we have just been saying they should do: use PBL as a strategy for all learners.

At-Risk Students and Technology

More than a decade of research, development, and implementation make it clear that ... integrating technology into the curriculum properly can produce dramatic change and improved prospects for at-risk students. The change can also be measured in classrooms transformed from places that many students wish to avoid to places where students are eager to work.

It was this declaration that caught my eye as I began to study the article in *Connecting the Bits* called "At-Risk Students: Technology's Particular Promise." This article is based on research conducted during the three-year Learning Tomorrow program, in which teachers and administrators from 10 schools were supported by a grant to integrate technology into their schools to meet student needs.

The researchers found that certain factors must be present for schools to be able to design a new learning environment. The first of these was a vision of what the school could become, a vision shared by a "critical mass of people in the district." In addition, schools need adequate time, good leadership, and teamwork throughout the district.

Although these factors are critical, I would like to focus on the finding from this project that "project-based learning and authentic, real-world applications increased student motivation." In fact, the report adds:

Learning Tomorrow teachers found that increased attendance and a willingness to "stay with the learning" were among the first results from a shift to technology-integrated learning. Because the students wanted to be in school to use the technology, they allowed themselves to expand their access to learning materials.

That is an amazing statement. Students and teachers accepted and made use of the access to new and rich technologically provided learning resources, and those resources helped to inspire as well as to make up for a lack of other sorts of resources in the schools. The report continues:

Typically Learning Tomorrow projects moved over time from teacher-directed activities to project-based learning, and student achievement began to take off as these changes occurred.

The results of PBL using technology for at-risk students were:

- increased engagement
- work on cognitively complex tasks
- a shift from rote learning to inquiry and all the higher-order thinking skills that are part of such research

Many of the participating schools also found ways to involve the families of at-risk students in both the new technologies and in the projects their kids were doing.

Assessments were also developed using technologies—videotapes, electronic portfolios, and so on. The statement below indicates the tremendous effect this approach to assessment had on these students:

For many at-risk youngsters who have not been recognized or taken seriously in the past, preparing presentations of their assessment documents for parents, school boards, and community members is the highlight of their school careers.

My conclusion is that at-risk children, like their less at-risk counterparts, thrive in a PBL environment in which technology connects them to the real world by bringing access to resources into their classroom. And the ability of technology-supported PBL to provide an environment for creativity, invention, and construction of ideas into a product that can be shared is clearly not something that is owned by any particular group. We all respond to being able to show our work and our progress to others we care about. It brings out the best in us.

Let us now move to the third report, *Learning for the 21st Century*, which is the work of a group of primarily technology business people who work on education efforts within their companies. They asked the question: "How can we best prepare students to succeed in the 21st century?" We'll take a look at their answers, with a particular eye to how their recommendations pertain to using PBL strategies with at-risk learners.

Learning for the 21st Century

The Partnership for 21st Century Skills bring together notions of skills we need for this century with understanding about the nature of learning from Bransford, Brown, and Cocking's important book *How People Learn*. Three conclusions from that book affect how we need to think about teaching and learning:

- Students arrive at learning with prior knowledge, and this knowledge must be built on to achieve new levels of understanding.

- Students require a strong foundation of facts, ideas, and contexts to be able to organize and use their knowledge.
- Students need to learn to think deliberately about their learning processes if they are to be able to manage their own learning.

The focus of the 21st Century Skills project is on building new learning environments based on those three important understandings about how we learn and on six key elements that will lead us to 21st century learning. We need to emphasize core subjects, learning skills, modern tools, modern context, modern content, and modern means of assessment.

According to this report, education should connect with students' lives and should recognize that those lives are increasingly diverse. The authors argue that learning skills combined with connections between learning and the world students live in lead to achievement, to motivation, and to a lower drop-out rate.

What learning skills? Information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. What tools? Spreadsheets, design tools, communication and research tools, and productivity tools. Context? Help students develop connections between their learning and their lives. Content? In addition to traditional content, schools need greater emphasis on global awareness, economic literacy, and civic literacy. These four pieces of the six elements—learning skills, modern tools, real context, and contemporary meaningful content—are also essential elements of a PBL environment. This group is talking about substantial, widespread, meaningful change in the way we educate our children. As they state it:

Students will spend their adult lives in a multitasking, multifac-

eted, technology-driven, diverse, vibrant world—and they must arrive equipped to do so. We also must commit to ensuring that all students have equal access to this new technological world, regardless of their economic background.

You may be thinking, “Sure, right. During this era of tight funding, we are supposed to engage in widespread risky change?” Their argument is yes, because “current budget constraints eventually will subside, [but] the long-term need for 21st century learning will not: Accelerating technological change, rapidly accumulating knowledge, increasing global competition and rising workforce capabilities around the world make 21st century skills essential.”

Conclusion

These groups share a great deal of commonality in their educational aims:

- Build on what students know, through meaningful, relevant activity.
- Use technological tools to help in understanding and communicating.
- Present a product to an audience who can give students important feedback and a sense of satisfaction.

And clearly these three groups believe, as I do, that this strategy will help all learners achieve better understanding, retention, and use of the content with which they are working.

What we still lack, though, is the evidence that will convince individual teachers and administrators that this highly desirable end will also increase standardized test scores in the era of NCLB. Doctoral students looking for dissertation topics, where are you?

Resources

Diane McGrath's PBL Web site (<http://coe.ksu.edu/PBL/>), will take you directly to the Web resources discussed in this column, as

well as resources that have been mentioned in other columns. So check in early, and check in often.

Bransford, J., Brown, A., & Cocking, R. (Eds.) (2000). *How people learn*. Washington, DC: National Academy Press. Available: <http://www.nap.edu/html/howpeople1/>.

Levin, D., Arafah, S., Lenhart, A., & Rainie, L. (2002). *The digital disconnect: The widening gap between Internet-savvy students and their schools*. Washington, DC: Pew Internet & American Life Project. Available: http://www.pewinternet.org/report_display.asp?r=67.

NEA Foundation for the Improvement of Education. (2000). *Connecting the bits*. Washington, DC: Author. Available: <http://www.nfie.org/publications/connecting.htm>.

North Central Regional Educational Laboratory & the Metiri Group. (2003). *enGauge 21st century skills: Literacy in the digital age*. Naperville, IA, and Los Angeles: Authors. Available: <http://www.ncrel.org/engauge/skills/skills.htm>.

Partnership for 21st Century Skills. (2003). *Learning for the 21st century*. Washington, DC: Author. Available: <http://www.21stcenturyskills.org/reports/learning.asp>.

Yau, R. (1999, Fall/Winter). Technology in K–12 public schools: What are the equity issues? *EquityReview: A Review of Issues Related to Equity in Education*. Available: <http://www.maec.org/techrev.html>.



Diane McGrath is an associate professor of educational computing, design, and online learning at Kansas State University. She is former editor of the *Journal of Computer Science Education* (now published on ISTE's SIGCS Web site as *JCSE Online*) and the *Journal for Research on Computing in Education* (now the *Journal of Research on Technology in Education*), and she has written a number of articles related to technology and higher-order thinking for ISTE periodicals.

